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Recent studies, showing that the majority of questions asked by teachers elicit little more than memorized answers from students, indicate that more effective teacher training in questioning techniques is needed. Teachers may be trained in the inquiry method, which necessitates that a student learn how to ask appropriate 'why' questions, or he may be trained in a very different approach to elict behaviors from students that are essential for the student to accomplish his cognitive task. As another alternative, teachers may also be trained to use certain verbal cues in their questions (the "grammar of the interrogative") which indicate the kind of cognitive behavior needed by the student to answer appropriately. (A 25-item bibliography is included.) (LP)

TEACHER STRATEGIES OF QUESTIONING FOR ELICITING SELECTED COGNITIVE STUDENT RESPONSES

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The art of questioning is probably the most ancient pedagogical method. The dialogues of Socrates and dialectics of Plato have often been considered the epitome of intellectual discourse, and have been used throughout history as a model for all teachers. In recent years, however, a number of studies have pointed out that the questions teachers ask are most frequently of the lowest order intellectually, requiring little more than the recall of memorized material (Floyd, 1961; Gallagher, 1965; Davis and Tinsley, 1967). Gallagher. (1965),moreover, has shown that the high frequency of cognitive-memory questions results in a correspondingly high proportion of convergent responses, limiting sharply the likelihood of divergent or creative activity on the part of pupils.

Perhaps these reports of the low level of teacher's questions are to be expected. Questioning, as a particular method of teaching, has received little attention since the decline of the Scholastic tradition which reseed so heavily upon faith and authority and the perfection of logical syllogisms. The catechetical method of memorized answers to set questions, long used in American education, survives today as a sterile replica of the model made famous by Thomas Acquinas in the Summa Theologica.
In the following section three specific approaches to questioning will be discussed: inquiry questions, eliciting questions, and the effect of training upon question asking behavior.

Questions and Inquiry-Oriented Strategies of Teaching

Inquiry Method:

The current interest in inquiry or discovery oriented approaches to teaching

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has produced a renewed interest in questioning. Suchman's (1961,1963,1964) Inquiry Training has focused upon the ability of the student to hypothesize about the relationship of events in order to explain phenomena, fitting tentative explanations into a larger consistent theory capable of taking into account dissonant events (Festinger, 1957). Such a process depends heavily upon learning to ask the appropriate "Why" questions (Isaacs, 1938, 1960). These may include informational and explanatory questions, as well as evaluative questions (Kuslan and Stone, 1968).

A. Informational Questions

1. The why of purpose which seeks to find out the purpose or motivation of an event. "Why did Hitler attack Poland?"
2. The why of justification which seekks the logical necessity or rules, customs, or conventions. "Why is man classed as a mammal?"

B. Explanatory Questions

1. The whys of causation which seek to establish relationships among various factors resulting in some event. "Why is there thunder and lightning when it rains?"

C. Evaluative Questions

1. How do we know? (Validity of the evidence)
2. Are we justified in this assumption? (Correctness of logical inference)
3. Are we justified in this conclusion? (Correctness of logical conclusion)

In many respects, the Suchman method or Inquiry is not unlike the strategy used to play the game "Twenty Questions." His early investigations (1963) have suggested that children can learn to develop a questioning style that will lead them to form testable hypotheses and methods for verifying the hypothesis.

Whether these complex tasks can be accomplished in the absence of a rich background of subject matter (Kagan, 1965), or in disciplines other than science (Ausubel, 1963) remains to be demonstrated. In an effort to answer such criticisms of the inquiry approach Schomburg(1968) and Sheridan(1968), two of our colleagues

Tri-University Project, have conducted preliminary studies in social studies using a series of conceptual models to explain the location, shape, and function of American cities. Taken together the set of models represents a comprehensive theory of cities from the discipline of urban geography, against which children can then begin to ask relevant questions, compare and contrast models, or develop new ones, thus modifying or expanding the theory. Thus, some understanding of the underlying theory of the subject, what Brunner (1961) has called the structure of the discipline, may well be an important prerequisite to the ability to ask the right questions in an inquiry approach.

Eliciting questions:

A quite different approach to questioning has been developed in Taba's (1966) system of cognitive tasks or processes. A set of eliciting questions has been developed for use with each of the cognitive tasks of concept formation, development of generalizations, and the application of principles to new situations (Taba, 1967). Each teacher question is clearly designed to elicit certain essential behaviors by students which are necessary to the accomplishment of the cognitive task. The same technique has been extended to the valuing process in exploratory studies reported by Hills (1968) and Clegg and Hills (1968).

These efforts have been elaborated still further in a complex model of the teaching-learning process synthesized from several sources by the Tri-University Project (1968) in which eliciting questions were designed for each of the following aspects of the learning process.

1. Determining the focus of a problem
2. Concept formation
3. Making inferences and generalizing from data.
4. Valuing for policy making
5. Application generalizations to new situations.
6. Analysis and evaluation of both the process and the product of their work.
7. Selecting a policy consistent with values of highest priority.

This strategy of using carefully designed eliciting questions appears to have usefulness not only for instruction with children, but also with adult students in teacher education. This writer has demonstrated its use in a college methods class using academic content from urban geography as a means for studying the inquiry approach as a method of teaching (Clegg, 1969). A similar approach was found successful in a Title III Summer Workshop for experienced teachers. The merit of this approach in teacher education appears to be that it allows the teacher to gain first hand experience in the particular learning process before he begins to analyze it as a teaching method. In short, he is not overwhelmed by a new set of terms or a conceptual approach that is little more than verbiage or new pedagogical jargon to him.

Teacher Training in Questioning

The foregoing section of this paper has dealt with the development of appropriate strategies of questioning as an inherent feature of the instructional design. This section deals with efforts to develop teacher's questioning ability by means of systematic training in pre- and in-service education.

Two of the most frequently used guides to the cognitive level of teachers' questions has been Bloom's Taxonomy of Educational Objectives (1956), and Sander's Classroom Questions--What Kinds? (1966). Studies conducted by Clegg, Farley, and Curran (1967), and replicated by Farley and Clegg (1969), have shown that given training in the knowledge and use of the Bloom taxonomy (or in a form as modified by Sanders) that teachers ask significantly more questions at higher cognitive levels (p. .01) than teachers who have not had such training. In addition, these two studies found that a high degree of agreement could be obtained within and between several groups of raters, suggesting the conclusion that the taxonomy could be used as a common language in education for in-service or pre-service training of teachers.

The Rhetoric of Questioning

Analysis of the tape recordings of teacher questions in the study by Clegg, Farley, and Curran (1967) seemed to suggest that there was a specific pattern in the language teachers used in asking questions.

One of the conclusions suggested in the study by Clegg, Farley, and Curran (1967) was that there seemed to be a certain rhetoric of questioning that needed to be examined further. Analyses of the tape recordings suggested that a question must be framed in such a way that it contains the necessary verbal cues to the kind of cognitive behaviors that the student must pursue in order to formulate an appropriate response. Indeed, there seemed to be a kind of "grammar of the interrogative" that needs to be known by both those who frame and those who answer questions. The investigators speculated that if such a grammar of the interrogative were used by teachers, it could result in higher levels of questioning.

The possible existence of a "grammar of the interrogative" has become more apparent in the course of designing some of the protocols for scoring teacher responses in the study to be reported next by my colleague, Dr. Rosemarie McCartin (1969). As in the case of the earlier studies mentioned, operational definitions were formulated for each of the categories in the Bloom Taxonomy indicating what function or process the student was expected to perform.

Category	Operational Definition	Key Word
1. Knowledge	Recall from memory	Remember
2. Comprehension	Derive meaning from what is being communicated; interpret	Understand
3. Application	Use ideas, generalizations in new situations	Solve the problem
4. Analysis	Breakdown material into its constituent parts	Logical order
5. Synthesis	Put together elements from many sources into a new structure or rearrangement	Create
6. Evaluation	Make judgments about the worth or value of an idea, solution, method, etc. using a set of criteria as a basis for the judgment.	Judge by criteria

One of the protocols developed was that only the teacher's exact, operational words and the syntax of the question would be considered to assess its cognitive level. No inferences were made from student responses or other contextual clues.

Thus, the teacher's language pattern had to give sufficient verbal cues so that the student would have a clear understanding of what he was expected to do, and by inference, the cognitive level at which he was to respond.

A list of action verbs and phrases was developed which seemed appropriate for each level of the taxonomy and which was closely related to the key words listed above (Appendix A).

In analyzing the tapes in the study reported by McCartin (1969), the raters found a frequent repetition of those questioning words appropriate to the knowledge and comprehension categories, but few of any other level. Although this data is highly tentative, it does appear to confirm the concept of a "grammar of the interrogative" that can be known and used by teachers. The fact that it appears to be limited to the two lowest categories of the taxonomy is consistent with the findings of studies reported earlier that teachers generally ask low level questions. The conclusion appears inescapable that more effective methods of teacher training are needed if teachers are to be able to use effectively a grammar of the interrogative as part of their personal style of teaching. An alternative (or complementary) strategy to developing a rhetoric of questioning as a part of one's personal style, would be to insure that the desired eliciting questions were employed effectively in the curriculum design.

SUMMARY

While questioning is one of the most commonly used methods of teaching, the evidence from a number of recent studies indicates that the great majority of teachers questions are at a very low level intellectually, requiring little more than the recall of a memorized answer.

Three approaches to developing teacher strategies of questioning for eliciting higher level cognitive responses were discussed: (1) Inquiry questions as in the Suchman method, (2) eliciting questions organic to the instructional design, as in the Taba and Tri-University models, and (3) pre-service (or in-service) teacher

training in question asking behavior using a specific set of categories, such as the Bloom taxonomy.

Lastly, the development of a teacher style or rhetoric of questioning was discussed. The pattern of verbal cues in the teacher's language was seen as forming a possible "grammer of the interrogative" which could be manipulated to modify teachers questioning behavior.

Appendix A

Category	Key Word	Typical Question Words
1. KNOWLEDGE (Any question, regardless of complexity, that can be answered through simple recall of previously learned material.) e.g. "What reasons did Columbus give for wanting to sail west to find a new world?"	Remember	1. Name 2. List; Tell 3. Define 4. Who? When? What? 5. Yes or No questions: e.g. "Did...?" "Was...?" "Is...?" 6. How many? How much? 7. Recall or identify terminology. 8. What did the book say...?
2. COMPREHENSION (Questions that can be answered by merely restating or reorganizing material in a rather literal manner to show that the student understands the essential meaning.) e.g. "Give the ideas in your own words."	Understand	1. Give an example... 2. What is the most important idea? 3. What will probably happen? 4. What caused this? 5. Compare. (What things are the same?) 6. Contrast. (What things are different?) 7. Why did you say that? 8. Give the idea in your own words.
3. APPLICATION (Questions that involve problem solving in new situations with minimal identification or prompting of the appropriate rules, principles, or concepts.) e.g. "How big an air conditioner would you need for a room this size?"	Solve the problem	1. Solve 2. How could you find an answer to...? 3. Apply the generalization to.....

Category	Key Word	Typical Question Words
4. ANALYSIS (Questions that require the student to break an idea into its component parts for logical analysis: assumptions, facts, opinions, logical conclusions, etc.) e.g. "Are the conclusions supported by facts or opinion?"	Logical Order	1. What reasons does he give for his conclusions? 2. What method is he using to convince you? 3. What does the author seem to believe? 4. What words indicate bias or emotion? 5. Does the evidence given support the conclusion?
5. SYNTHESIS (Questions that require the student to combine his ideas into a statement, plan, product, etc. that is new for him.) e.g. "Can you develop a program that includes the best parts of each of those ideas?"	Create	1. Create a plan... 2. Develop a model... 3. Combine those parts...
6. EVALUATION (Questions that require the student to make a judgment about something using some criteria or standard for making his judgment.)	Judge	1. Evaluate that idea in terms of... 2. For what reasons do you favor... 3. Which policy do you think would result in the greatest good for the greatest number?

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